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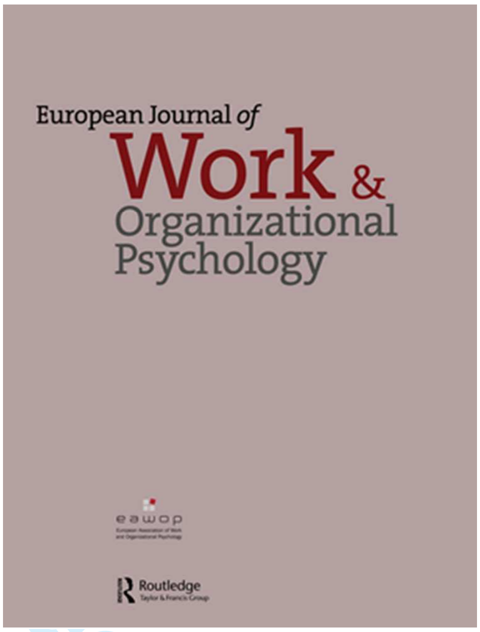

Energizing respites from work: A randomized controlled study on respite interventions

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Abstract

Increasing and new work demands drain employees' energy resources at work. This four-week longitudinal field experiment investigated the energizing potential of a respite intervention conducted at the workplace (either a simulated savoring nature intervention or a progressive muscle relaxation intervention). First, growth modeling analyses confirmed a linear trend for the growth of vigor and decline in fatigue across the days of the intervention group, indicating a typical upward resource trajectory. No changes appeared in the control group. Mediation analyses indicated that repeatedly engaging in a daily respite intervention influenced more stable energy levels after the intervention period indirectly through the immediate changes in daily energy levels during the intervention period. Findings suggest that, in some cases, respite interventions may present a useful tool to replenish and build energy resources at work. Implications for using respite intervention in organizational research and practice are discussed.

Keywords: energy management, vigor, fatigue, savoring nature, progressive muscle relaxation, respite intervention

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Due to increasing and new work demands more and more employees feel exhausted, stressed and burned out, which endangers not only employee health and well-being, but also an organization's productivity and innovation (e.g. Fritz, Lam, & Spreitzer, 2011; Pfeffer, 2010). This link between employees' energy and organizational outcomes becomes increasingly relevant because knowledge workers' performance depends on their ability and willingness to produce knowledge, which is closely related to individual's mood, motivation, and perseverance (Newell, Robertson, Scarbrough, & Swan, 2009). Moreover, longer working hours reinforce employees' need to conserve their energy. As a result, protecting, replenishing, and managing energy resources (i.e. promoting the human dimension of sustainability; Pfeffer, 2010) has become a crucial goal for individuals and organizations. This struggle for energy can be understood in the broader frame of the conversation of resources theory (COR; Halbesleben, Neveu, Paustian-Underdahl, & Westman, 2014; Hobfoll, 1989), which proposes a general motivation to protect current resources and acquire new resources.

Human energy is scarce and valuable because all acts depend on this resource (e.g. persistence on boring tasks, emotion control; for a recent overview see Quinn, Spreitzer, & Lam, 2012). Quinn et al. (2012) show that vigor and fatigue can be considered as two types of energetic activation in organizations. Energetic activation at work is defined as "the subjective component of the bio-behavioral system of activation experienced as vitality, vigor, enthusiasm, zest, etc." (Quinn et al., 2012, p. 341), which accounts for the degree to which people feel energized, rather than an objective indicator of their physical energy (Quinn et al., 2012). Vigor can be defined as an intrinsic energy resource (Gorgievski & Hobfoll, 2008), experienced as "high levels of energy and mental resilience while working" (Bakker, Demerouti, & Sanz-Vergel, 2014, p. 391). Fatigue refers to a state of being tired

(Barnes & Van Dyne, 2009), and is an adaptive response of an individual, which causes attention to shift from the external environment towards internal cues, with the purpose of resource conservation (Gorgievski & Hobfoll, 2008; Hancock & Desmond, 2001).

Energy management represents a pressing and constant challenge for workers (Fritz et al., 2011; Zacher, Brailsford, & Parker, 2014). For example, Kühnel, Zacher, de Bloom, & Bledow (2016) suggested that a self-initiated work break helps to restore energetic and self-regulatory resources, and demonstrated that taking self-initiated short breaks from work in the afternoon boosted daily work engagement. Only recently, studies have suggested that micro-activities, which can be performed across the workday, can support sustainable daily energy management at work (Clauss et al., 2016; Kinnunen, Feldt, de Bloom, & Korpela., 2015). To the best of our knowledge, no other research has evaluated whether micro-intervention can also be designed to promote respite from work. Thus, the aim of this study is to design two short daily respite interventions and to examine the extent to which these impact energetic activation in the form of vigor and fatigue.

We define *respite intervention* as a micro-intervention with a length of 5 to 10 minutes that can be completed at the workplace and gives an employee a reprieve from work, during which employees shift their attention away from work tasks (Hunter & Wu, 2015; Kühnel et al., 2016). We focus on two types of respite intervention: savoring nature and progressive muscle relaxation. With our study we seek to advance theory and research in three ways. First, past research on respites has mainly focused on employee's formal work breaks, demonstrating that whether recovery from work during breaks is effective depends on the activities people perform during this time and how they perceive these activities (Trougakos & Hideg, 2009; Zacher et al., 2014). Other research has focused on natural break activities (Kinnunen et al., 2015; Trougakos, Hideg, Cheng, & Beal, 2014; Zacher et al., 2014), on break interventions which were longer, could only be completed away from the workplace (e.g., de Bloom, Kinnunen, & Korpela, 2014), or interventions completed after work (Bono, Glomb, Shen, Kim, & Koch, 2013; Pilotti, Klein, Golem, Piepenbrink, & Kaplan, 2015). However, we aim to investigate if individuals can be trained to engage in respites from work during the day (i.e. short periods of rest or relief, which restore their energy resources).

Second, conservation of resources theory (Hobfoll, 1989) proposes that gains in resources are likely to facilitate further resource gain. Our study provides an empirical test of this assumption by evaluating the upward resource trajectory: examining the linear trend for the growth of vigor and the decline in fatigue over a period of ten days. Furthermore, we investigate whether these trajectories translate into more stable resource gains following the intervention period. Thus, we propose that respite interventions work by directly influencing employees' energy resources or energetic activation (Quinn et al., 2012). To understand the process, we focus on (i) the cumulative gain of energy resources over time and (ii) the translation of these immediate gains into more stable increases in energy resource levels.

Third, we utilize a randomized controlled trial (RCT) design following recent calls to strengthen research designs examining interventions in work environments (O'Shea, O'Connell, & Gallagher, 2016). Such designs are relatively rare in organizational studies, but are considered the gold standard in health research (Richardson & Rothstein, 2008). Overall, we contribute to furthering our understanding of the role of micro-interventions on personal resources at work (Clauss et al., 2016; Michel, O'Shea, & Hoppe, 2015).

Cumulative effects of respite interventions

Resources are "anything perceived by the individual to help attain his or her goals" (Halbesleben et al., 2014, p. 1338). Our main idea is that respite interventions provide a resource that helps to recover and build up energy levels. Energy (i.e. energetic activation, Quinn et al., 2012) itself can be seen as a rather volatile personal resource, which can change quickly (Halbesleben et al., 2014; ten Brummelhuis & Bakker, 2012). We expect that respite interventions will unfold their energizing effect over time leading to a cumulative effect. Although single events may lead to a dramatic loss of energy (Zohar, Tzischinski, & Epstein, 2003), energy levels, like other resources, generally change over time (Halbesleben et al., 2014; Hülsheger, 2016; Sonnentag, 2003). A stable increase in resources requires repetition, in a similar way that exercise needs to be repeated in order to translate into stable increases in fitness levels. Thus, we expect that the more times participants engage in a respite activity, the more energetic they will feel. Building on COR theory (Hobfoll, 1989), energy gains due to repeated exercise of a respite intervention can be described as a typical upward resource trajectory. Recent research has demonstrated that short daily interventions can indeed lead to such an upward resource trajectory (Pogrebtsova et al., in press).

Hypothesis 1: Those in the respite intervention group will demonstrate (a) a sharper positive growth curve in daily vigor and (b) a sharper negative growth in daily fatigue over the course of the intervention period, compared to the control group.

Translating immediate resource gains into stable energy resources

In addition to the daily building of resources, high energy levels over a longer time period are also important to consider as they are part of more stable personal resources, which comprise not only skills and knowledge, but also health, well-being and experiences (ten Brummelhuis & Bakker, 2012). Hence, high levels of vigor and low levels of emotional exhaustion during a longer period of time (weeks or months) can be seen as indicators of stable resources like health and well-being.

Daily vigor and fatigue may translate into more stable manifestations, and this is important for longer-term management of energy resources at work. For example, vigor has been shown to fluctuate across the workday, and such daily fluctuations are influenced by one's general or trait level of vigor (Sonnentag & Niessen, 2008). Thus, vigor is both a trait and a state concept, meaning that it has both individual and within-individual variation (Sonnentag & Niessen, 2008). In a similar manner, burnout is considered an end-state or syndrome experienced by workers overwhelmed by the demands of their work (Leiter, 1992; Xanthopoulou & Meier, 2014) and a dynamic phenomenon (Dunford, et al., 2012) that can be examined in a daily basis (Sonnentag, 2005). At this level, burnout can be considered as daily experiences of exhaustion, cynicism and reduced personal efficacy (Xanthopoulou & Meier, 2014). Daily fatigue, has similarities with the daily exhaustion component of daily burnout, but is less extreme (Van Hooff, Guerts, Kompier, & Taris, 2007).

We propose that engaging in a respite intervention at work will promote immediate energy resources (i.e. increase daily vigor and reduce daily fatigue after the respite activity) compared to the control condition, which will in turn, be translated into a stable resource gain over time after the intervention is completed (see Figure 1). This idea is in line with a previous finding showing that the cumulative experience of daily resources promoted the development of more stable resources (Cohn, Fredrickson, Brown, Mikels, & Conway, 2009). Conversely, from a COR perspective, burnout results through the continued loss or threat to resources or the insufficient return of resources following an investment of resources (Halbesleben & Buckley, 2004). We expect our resource interventions to prevent this continued resource loss: Thus, we hypothesize:

Hypothesis 2a: Engaging in a respite intervention will increase afternoon vigor, which will indirectly lead to an increase in vigor after completion of the intervention period.

Hypothesis 2b: Engaging in a respite intervention will decrease evening fatigue, which will indirectly lead to a decrease in exhaustion after completion of the intervention period.

Creating a respite intervention

What kinds of respite activities provide a good basis for a respite intervention? When employees are fatigued and need to restore their energy at work, they often try to relax (e.g., napping, closing eyes for a moment) or savor nature (e.g., looking out of the window, going for a walk; e.g., Fritz et al., 2011). Both activities can be performed in a great variety of ways and have been turned into interventions, which have been investigated in work, health, and environmental psychology. Hence, these activities may possess the potential to create small respite interventions, which support employee's energy resources even when performed for a short time at the work desk. We thus focused on these two interventions in the present study.

First, the restorative benefits of nature, and in particular its positive effects for health, have been widely acknowledged and researched (for a recent overview see Hartig, Mitchell, de Fries, & Frumkin, 2014). Exposure to nature promotes restoration and the recovery of depleted energy resources (Beute & de Kort, 2014), but is not restricted to contact with real natural sites, and can include indirect exposure through simulations of natural environments in the form of media, scents, or sounds of nature (Keniger, Gaston, Irvine, & Fuller, 2013).

Few studies have investigated the restorative effects of simulated natural stimuli in the work context. In one cross-sectional study with university employees (Largo-Wight, Chen, Dodd, & Weiler, 2011), indirect nature contact through exposure to photographs or sounds was negatively related to perceived stress. In another study conducted in a simulated open plan office (Jahncke, Hygge, Halin, Green, & Dimberg, 2011), participants worked for two hours and then took a 7-minute break in one of four different restorative conditions: (1) nature movie with river sounds, (2) river sounds only, (3) silence, and (4) noise. Watching the nature video improved self-rated energy compared to only listening to the river sound or continued noise. Korpela, de Bloom and Kinnunen (2015) point out the potential of using natural environments and stimuli for recovery at work through exposure to nature during the workday, which provide interesting opportunities for respite interventions. Hence, savoring nature, even through indirect contact, may be suitable way of creating short respites at work.

Second, the use of relaxation techniques has frequently been associated with improved well-being, health, and performance. A meta-analysis on stress-management training revealed that relaxation interventions are both effective and frequently used in stress prevention in clinical and non-clinical individuals (Richardson & Rothstein, 2008). However, few studies have considered the benefits of training workers to relax during work breaks, although doing so has been shown to reduce end-of-workday fatigue (Trougakos et al., 2014). To our knowledge, only one study directly tested relaxation interventions in the work context, demonstrating a reduction in strain for the Progressive Muscle Relaxation (PMR) group compared to a 'small talk' break group (Krajewski, Wieland, & Sauerland, 2010).

Despite these first steps, there is still much to learn about implementing savoring nature and relaxation interventions in the workplace. Specifically, we need to understand whether very short daily exercises during work promote energy resources among employees. Overall, savoring nature and relaxation interventions may well be able to offer an energizing respite from work, which also helps to fuel energy levels over time.

Method

Sample

To recruit participants, administrative employees and knowledge workers from different companies in and around Stuttgart, Germany, were approached via company mailing lists or individually and invited to participate in the study. The companies were informed about the study goals and procedure beforehand and supported it. Depending on company regulations, the works councils were informed and gave permission. Potential participants were informed about the goals and procedures of the study, the benefits of small respite interventions, and practical considerations such as confidentiality, the length of the study, and the training sessions. Participants received no payment for their participation.

A total of 122 employees arranged a personal meeting to learn more about the study.

Five of the 122 employees did not attend the first meeting and were excluded from the sample. Participants (N = 117) who attended this first meeting were randomly assigned to a respite intervention group (N = 78; savoring nature intervention group SNI N = 39; progressive muscle relaxation intervention group PMRI N = 39) or the waitlist control group (CG; N = 39). Randomization was held constant within each organization to avoid organization effects. A total of 35 individuals dropped out after the first meeting (refer to Figure 2 for reasons). The final sample consisted of 82 participants comprising 52 individuals in the respite intervention group (SNI N = 26, PMRI N = 26), and 30 individuals in the CG (see Figure 2 for the Consort flow diagram; Moher, Schulz, & Altman, 2001; Schulz, Altman, & Moher, 2010). No differences in dropout between conditions were found ($\chi 2$ (2, 117) = 1.31, p = .52). Analyses of trait differences between compliant and non-compliant participants revealed no differences before the intervention for exhaustion (t(115) = -1.25, p = .213) or vigor (t(115) < 1, p = .809; see Table 1 for means and SD).

Participants in the final sample were 36 women and 46 men with a mean age of 36.94 years (SD = 11.40), average job tenure of 7.14 years (SD = 6.84), and an average weekly work time of 41 hours (SD = 8.05). Most participants were permanently employed (87.8.2%) full-time employees (89.0%) who reported a university degree as their highest educational qualifications (6.1% PhD; 37.8% Master degree; 17.1% Bachelor degree; other qualifications: 23.2 % completed professional training; 15.9% high school diploma). Participants worked in a wide variety of sectors.

Procedure

The study lasted four weeks overall: In week 1, participants had the first meeting where they completed the baseline survey and were subsequently trained in one of the two interventions (if in the intervention group). In weeks 2 and 3, participants completed the daily measures and the interventions (for the intervention group). In week 4, participants completed the post-questionnaire.

Using standardized manuals, trained researchers explained and practiced the interventions with the intervention participants in order to facilitate their practice and avoid potential difficulties (Andersson, Carlbring, Berger, Amlöv, & Cuijpers, 2009). At the first meeting, participants received a diary booklet including the written instructions for one of the respite interventions and a flyer describing the procedures and including the links to the online surveys and online interventions. The audio files included in the interventions could be accessed via the internet using all kinds of internet-enabled devices (e.g., computer, smartphone, iPads etc.) and listened to privately using ear plugs. Participants were free to choose between the online and the paper-and-pencil versions of diary survey and intervention manuals. Daily emails (three in the intervention groups and two in the CG) reminded participants to complete the surveys and intervention at the appropriate times of the day. After completion of the study, CG participants received training in both interventions.

All participants answered two general online surveys: one assessing demographic information and baseline measures in the week before starting the diaries and another assessing the post measures in the week after finishing the diaries. Participants completed daily surveys on 10 consecutive work days during April 2013. Each day, participants were asked to assess their current well-being in the morning before starting work (morning survey) and in the evenings after at least two hours of leisure time (evening survey). Additionally, participants in the intervention group were instructed to do their respective intervention during their lunch break as previous research has shown that relaxing interventions during lunch breaks are more effective than interventions at other times (Krajewski et al., 2010).

Respite intervention. Participants executed one of two respite interventions: savoring nature (SNI) or progress muscle relaxation (PMRI). The SNI combined the presentation of auditory stimuli of a natural environment with a guided imagination technique (Gierra &

Klinkenberg, 2005), using positive imagination and visualization processes to provide relaxation and detachment. To facilitate the savoring of a natural environment, participants listened to a natural soundscape while completing the interventions (Alvarsson, Wiens, & Nilsson, 2010; Ratcliffe, Gatersleben, & Sowden, 2013). Participants could choose between five natural soundscapes, which had the highest restorative potential in a pilot study with ten participants: bird song, bird song at a forest stream, rain forest, seagulls at the seaside, and summer rain. To facilitate focusing on the intervention, the intervention started with a short mindfulness component in which participants were instructed to concentrate on their breathing for a few moments (Michel, Bosch, & Rexroth, 2014). The subsequent imagination intervention requested participants to first imagine the natural surroundings and perceive their environment with their different senses (adapted from Gierra & Klinkenberg, 2005). Participants were instructed to fully immerse themselves in the situation and enjoy it in order to promote the savoring component of the intervention and to help participants to focus on the positive experience. After two additional minutes of savoring, the intervention ended with another mindfulness section to soften the transition from imagination to reality. Participants were instructed to concentrate on the here and now, deepen their breathing and start moving their fingers. During the intervention phase, participants could chose to listen to natural sounds with instructions (7:54 minutes) or without instructions.

As described for the SNI, the PMRI started with a first short mindfulness component followed by the muscle relaxation intervention and ended with the described savoring intervention and second mindfulness section. Participants could choose to do the PMRI either by following verbal instructions (7:05 min.) and listening to relaxing music (7:05 min.) or by instructing themselves while listening to the same music file or by not using any audio file. Instructions for self-intervention were given in the booklet. Progressive Muscle Relaxation is an established and widely applied relaxation technique, which uses tension and relaxation of different muscle groups. Following the shortened PMR protocol by Bernstein and Borkovec (2002), participants progressed through a series of 7 muscle contraction-relaxation sequences starting with the dominant arm followed by the non-dominant arm, the facial muscles, the neck muscles, the muscles of the torso, the dominant leg and ending with the non-dominant leg. Each group of muscles was contracted for 5 to 7 seconds followed by relaxation of the muscles for 20 seconds in each sequence. Crucial for the positive impact was that participants experienced and savored the difference between the tension and the relaxation.

Pre-Post Assessments

The two general online surveys in the weeks before and after the two intervention weeks included measures of vigor, exhaustion, and demographic items including age, gender, tenure, and level of education. Vigor and exhaustion served as contrasting indicators of energetic activation (Quinn et al., 2012). Cronbach alpha coefficients are shown in Table 1.

Vigor was assessed with the vigor subscale of the *Utrecht Work Engagement Scale* (UWES- 9; Schaufeli, Bakker, & Salanova, 2006). Participants rated three statements on a 7-point scale (1=*never*, 7 = *always*). A sample item is “At my job, I feel strong and vigorous”.

Emotional exhaustion was measured with the *Maslach Burnout Inventory – General Survey* (MBI-GS, Maslach & Jackson, 1986; Schaufeli, Leiter, Maslach, & Jackson, 1996; German translation: Enzmann & Kleiber; 1989). The participants were asked to rate five statements on a six-point Likert scale (1 = *never*, 6 = *every day*). A sample item is “I feel emotionally drained by my work”.

As emotional exhaustion and vigor are highly related variables, we conducted confirmatory factor analyses with the T1 study variables using MPLUS 7.3. We found that the two-factor model with independent but correlated factors for vigor and emotional exhaustion showed an acceptable fit to the data ($\chi^2(19, N= 83) = 40.90, p = .01$; CFI =0.95;

RMSEA = 0.12; SRMR =.06) and was superior to a one-factor model combining vigor and exhaustion (χ^2(20, *N*= 83) = 113.20, *p* = .001; CFI =0.77; RMSEA = 0.24; SRMR =.12).

Daily Assessments

During the two intervention weeks, all participants assessed their energy levels in morning upon starting work, and after work by completing evening diaries. Vigor and fatigue served as momentary indicators of energy resources. Finally, participants in the intervention group rated the intervention experience after intervention completion during the lunch break.

Afternoon vigor. Participants rated their levels of vigor referring to their working time after lunch in the afternoon. Afternoon vigor was assessed with the three-item vigor subscale of the UWES-9 on a five-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). We adapted the items to measure momentary fluctuations in vigor following the procedure by Bakker and Xanthopulou (2009; e.g., "This afternoon at work, I felt bursting with energy.").

Evening fatigue was measured with the item "How fatigued do you currently feel?" on a five-point Likert scale (1 = *not at all tired*, 5 = *very tired*). The validity of this single-item measure has been previously established (Van Hooff et al, 2007).

Analysis Strategy

SNI and PMRI were treated as one respite intervention condition because we had parallel hypotheses for the effects and underlying mechanisms of both interventions. Due to the rather small number of participants per intervention group, we did not analyze the two groups separately as we had initially planned.[1] Treating SNI and PMRI participants as one respite intervention condition was possible because the groups did not differ in vigor or emotional exhaustion before and after the intervention (all *t*'s < 1.75, all *p*'s > .05). There were no differences in the number of completed respite exercises between the SNI (M = 9.08,

[1] We thank an anonymous reviewer for this suggestion.

SD = 1.23) and PMRI groups ($M = 9.12$, $SD = 1.21$; $t(50) = -0.11$, $p = .91$). Hence, there was no reason to consider the intervention activities separately.

Hypothesis 1 was tested through growth modeling, using random coefficient models and following the sequence suggested by Bliese and Ployhart (2002) with R (R Core Team, 2014) using the multilevel package (Bliese, 2013a). The two daily dependent variables (afternoon vigor and evening fatigue) were nested within participants. Two separate two-level growth modeling sequences were estimated, one for afternoon vigor (658 days) and another for evening fatigue (654 days). Each participant responded an average of 8.2 days. Each growth modeling sequence started with the estimation of increasingly complex models and Log likelihood tests to compare the goodness of fit across the models to ensure the greatest power and parsimony (Bliese & Ployhart, 2002). Net increases in log likelihood values were examined to make decisions about model fit in relation to random or fixed intercepts, random or fixed slopes and autocorrelation. Before adding level 2 predictors, we examined: 1) the null-model to check intercept variation (participants randomly vary or not in terms of their mean levels of the dependent variable), 2) the form of the level-1 relationship between time and the dependent variable (model 1 indicates if the relationship is positive or negative; linear, quadratic or cubic), 3) if the strength of the relationship between time and the dependent variable randomly varies among individuals, and 4) if there is significant autocorrelation in the data. Once this was checked, the next step was to add level-2 variables (e.g., condition) to explain the random variation in intercepts (model 2, explain differences in mean levels of the dependent variable) and to add the interaction between time and condition to explain the time-dependent variable slope (model 3, explains the differences between slopes based on condition).[2]

[2] A more detailed description of this process can be found in Bliese and Ployhart (2002), and specific instructions on how to run it in R are available from Bliese (2013b).

We expected that participants in the intervention condition would show sharper positive growth of daily afternoon vigor and sharper negative growth of evening fatigue over the course of the two-week intervention period, in comparison to the participants in the control condition. This is indicated by a significant interaction effect between time and condition in model 3. However, given that the expected effect sizes tend to be small, simple post hoc T-tests were run to detect if the slopes for the intervention condition were significantly different from 0, and therefore not flat, so we could show the presence of cumulative effects of the intervention.

Hypothesis 2 was tested at the person level using the pre-post data and indicators of daily change of vigor and fatigue by using the estimated intercept and slopes of the growth models for each person. This operationalization of the daily changes in vigor/fatigue provides us with the necessary information to operationalize the mechanism of gains in daily energy during the intervention. In contrast to change scores, intercepts indicate the starting energy levels during the first intervention day (time 0), which can be interpreted as an initial resource gain, and slopes indicate the rate of consistent change over the days of the intervention, which can be interpreted as the cumulative resource gain. To separate between initial and cumulative resource gains, two multiple mediation models were tested, in which the intercept and the slope coefficients of afternoon vigor and evening fatigue respectively served as parallel mediators. This provides a direct connection between the growth analyses (hypothesis 1) and the mediation analyses (hypothesis 2).

The proposed mediations were tested in regression analyses using 10000 bootstrap samples (SPSS macro PROCESS, model 4; Hayes, 2013). Condition was coded as a binary variable (1 = respite intervention, 0 = control group). To test H2, condition was used as a predictor (Mediation model 1: condition → intercept of afternoon vigor (mediator 1) and slope coefficient of afternoon vigor (mediator 2) → post-intervention vigor; mediation model

2: condition → intercept of evening fatigue (mediator 1) and slope coefficient of evening fatigue (mediator 2) → post-intervention emotional exhaustion).). Pre-intervention energy levels (pre-intervention vigor in mediation model 1 and pre-intervention emotional exhaustion in mediation model 2) were included as control variables. An absence of zero in the 95% bias-corrected confidence intervals (95% BCCI) of an indirect effect indicates significant mediation. The total indirect effect describes the overall mediation effect of the two mediators and, hence, the overall mediation by the daily energy trajectories during the intervention period. Here, we expected significant total indirect effects and explored the respective contribution of initial and cumulative resource gains.

Sensitivity analyses using G*Power version 3.9.1.2 (Faul, Erdfelder, Lang, & Buchner, 2007; Faul, Erdfelder, Buchner, & Lang, 2009) indicated that we had sufficient power to detect medium effect sizes given our sample size, hypotheses and assuming a power of .80 with alpha error probability set to .05 (Murphy, Myors, & Wolach, 2009). We additionally conducted post-hoc power analyses using G*Power version 3.9.1.2 (Faul et al., 2007; Faul et al., 2009), which demonstrated that the observed power was higher than the conventional level of 0.80 (Murphy, Myors, & Wolach, 2009) for all analyses conducted, based on the number of predictors, sample size, observed effect size (f^2) and alpha error probability set to .05. To save power, only the baseline energy levels were included as control variables, although this was not strictly necessary due to successful randomization of our subjects to conditions which resulted in no baseline differences in demographic variables or variables used in the analyses (see Bernerth & Aguinis, 2016 for recommendations on control variable usage). As we controlled for baseline vigor and baseline emotional exhaustion, the remaining variance which can be explained by condition and the mediators is rather small; thus, even small and marginally significant effects should be considered carefully.

Results

Preliminary Analyses

Means, standard deviations, and intercorrelations between the study variables are displayed in Table 1. Demographic variables age, sex, and working hours were not associated with any of the dependent variables (all $r < .20$, all p's > .05). Moreover, no significant differences between intervention and control group were found in sex ($\chi^2(1) = .30$, $p = .59$), age, working hours, vigor, and exhaustion before the intervention period (all t's < 1.27, all p's > .05; see Table 1 for descriptives). This indicates a successful randomization between intervention and control group. On average, participants completed a respite intervention nine times out of ten during the intervention period ($M = 9.10$, $SD = 1.21$).

Cumulative Growth of Energy Resources

Growth Modeling was used to examine how daily afternoon vigor and evening fatigue changed during the intervention period in the different experimental groups. The ICC(1) value for afternoon vigor was 0.47 and for evening fatigue was 0.35, indicating that 47% of the variance in afternoon vigor and 35% of variance in evening fatigue can be explained by between-person differences. The information from the ICC(1)'s indicates that a substantial percentage of variance of afternoon vigor and evening fatigue is explained by both between and within-person differences, and this indicates that it is appropriate to conduct a multilevel analysis of the data that is nested within participants (Bliese & Ployhart, 2002).

Table 2 summarizes the results of the growth multilevel modeling for afternoon vigor. The initial model showed a significant positive linear relationship between time and afternoon vigor indicating that all participants (experimental and control) were reporting higher levels of vigor as they continued through the intervention period. Specific tests of sequential intermediate models (not presented in the table) revealed that (a) individuals randomly vary in terms of their mean levels of afternoon vigor, (b) there is a linear, but not quadratic, relationship between time and afternoon vigor, (c) the strength of the linear relationships randomly varies among individuals, and (d) there is significant autocorrelation in the data and this needs to be controlled for in model 2. In model 2, we added the level-2 variable, condition, to explain the random variation in intercepts using participant differences based on control or experimental manipulation. In our case, we found that condition was a significant factor: those in the experimental condition reported higher mean levels of afternoon vigor than control participants. The final step, model 3, involved examining attributes of individual respondents that are related to the time-afternoon vigor slope variability. Because this is an intervention study we examined if condition could explain some of the variation in the time-afternoon vigor slope. We did not find a significant effect for the interaction term between time and condition using this two-tailed test. To further examine the results, Figure 3 was created by using the parameter estimates of model 3 and applying it to the multilevel growth equation to predict the afternoon vigor scores over a 10 day period (this strategy is the same as one interaction terms are plotted from regression equations). This figure shows the positive growth trend of the time-afternoon vigor slope over the ten intervention days for the participants in the intervention conditions as compared to the control condition. Post-hoc slope tests were calculated using the parameter estimates and the values from the variance-covariance matrix of model 3 to further explore the visual data. Using one-tailed t-tests and a liberal critical p-value to avoid type II errors, the intervention condition slope was significantly different from the control condition slope (reference group, $t(658) = 1.38$, $p = .08$). Moreover, a detailed analysis of the slopes for each condition shows that the control group slope was not significantly different from 0 and therefore flat ($t(658) = 0.90$, $p = .18$). Yet, the intervention group slope showed a significant positive slope ($t(658) = 3.41$, $p < .001$) indicating that participants in the intervention condition, as compared to the control condition, showed a positive increment of their daily afternoon vigor over the intervention days.

Table 3 summarizes the results of the growth multilevel modeling for evening fatigue. Model 1 did not show a significant positive linear relationship between time and evening fatigue indicating that when taking the data all together, participants' evening fatigue did not change as they continued through the intervention period. However, this result is expected as it may be confounded by the fact that intervention and control participants are included without controlling for their assigned manipulation. Specific tests of sequential intermediate models (not presented in the table) revealed that (a) individuals randomly vary in terms of their mean levels of evening fatigue, (b) there is not a significant linear, nor quadratic, relationship between time and evening fatigue, however (c) the strength of the non-significant linear relationship randomly varies among individuals, and (d) there is no significant autocorrelation in the data and it does not need to be controlled. In model 2, the level-2 variable condition explained the random variation in intercepts using participant differences based on control or experimental manipulation: condition was a significant predictor indicating that those in the experimental condition reported lower mean levels of evening fatigue than control participants. The final model 3 shows a significant effect for the interaction term between time and condition using a liberal critical p-value of 0.10. Like Figure 3, Figure 4 was created to explore the nature of the interaction effect and shows the negative growth trend of the time-evening fatigue slope over the ten intervention days for the participants in the intervention condition as compared to the control condition. Post-hoc slope tests were conducted using one-tailed t-tests and a liberal critical *p*-value, the intervention condition slope was significantly different from the control condition slope (reference group, $t(654) = -1.76$, $p = .04$). Moreover, a detailed analysis of the slopes for each condition shows that the control group slope was not significantly different from 0 and therefore flat ($t(654) = 0.65$, $p = .26$). The intervention group slope showed a significant negative slope ($t(654) = -2.02$, $p = .02$) indicating that participants in the intervention condition, as compared to the control condition, showed a significant decline of evening fatigue over the intervention days. The results from the multilevel growth support hypothesis 1.

Translating immediate gains into more stable energy resources

We expected that the respite intervention would increase energy levels after the work break, which would indirectly strengthen more stable energy levels after the intervention period (H2). This hypothesis was tested in two multiple mediation models separately for post-intervention vigor and post-intervention exhaustion (see Figures 1 and 2). As can be seen in Table 4, the effect of condition on the intercept and the slope coefficients of afternoon vigor were positive. Using one-tailed t-tests and a liberal critical *p*-value to avoid type II errors, the effect on the intercept was significant and the effect on the slope was marginally significant (p = .105). Both intercept and slope coefficient positively predicted post-intervention vigor, which indicates that both initial and cumulative gains in afternoon vigor contribute to the increase in vigor after the intervention period. Moreover, using a liberal critical *p*-value to avoid type II errors, the indirect effects for the intercept coefficient (mediator 1; B = .16, *SE* = .10, *95% BCCI* [-.016, .370]); *90% BCCI* [.007, .330]) and for the slope coefficient (mediator 2; B = .08, *SE* = .06, *95% BCCI* [-.014, .210]); *90% BCCI* [.002, .184]) and the significant total indirect effect for both mediators (B = .24, *SE* = .12, *95% BCCI* [.014, .487]); *90% BCCI* [.053, .442]) indicate that both initial and cumulative gains in afternoon vigor contribute to the increases in vigor after the intervention period. This provides support for hypothesis 2a.

A slightly different pattern appeared for exhaustion. As can be seen in Table 5, condition negatively affected the intercept and slope coefficient of evening fatigue indicating that condition lead to both an initial drop in evening fatigue and an additional decline in evening fatigue. Only the intercept coefficient of evening fatigue was positively related with emotional exhaustion after the intervention period. Moreover, a significant indirect effect for the intercept coefficient (mediator 1; B = -.09, *SE* = .06, *95% BCCI* [-.225, -.003]); *90% BCCI* [-.192, -.011]) and a non-significant indirect effect of the slope coefficient (mediator 2; B = -.04, *SE* = .03, *95% BCCI* [-.109, .019]); *90% BCCI* [-.095, .010]) indicate that the initial decline in evening fatigue mainly drives the decrease in emotional exhaustion after the intervention period. Moreover, the total indirect effect was significant (B = -.12, *SE* = .07, *95% BCCI* [-.273, -.020]); *90% BCCI* [-.240, -.032]) indicating that daily fatigue levels indeed mediate the influence of the intervention on post-intervention exhaustion. This provides support for hypothesis 2b.

Discussion

The aim of this study was to explore the potential of brief daily respite interventions for employees' energy resources. We expected that engaging in a daily savoring nature or relaxation intervention would strengthen daily energy resources (i.e. vigor) and mitigate against the depletion of daily resources (i.e. fatigue) compared to a control condition. We further expected that these daily effects would indirectly lead to more stable benefits for energy resources. Growth modeling showed that afternoon vigor levels increased during the intervention period in the intervention groups, while afternoon vigor levels remained stable in the control group. We saw a similar pattern of decline in evening fatigue for the intervention group but not for the control group. This indicates that the intervention had cumulative effects over time. Our mediation analyses indicated that the effects of the intervention first occurred immediately and then translated into more stable post-intervention changes.

Quinn et al. (2012) suggested that future research needs to investigate how the context of work can restore human energy. Our results reveal the positive potential of savoring nature and progressive muscle relaxation as respite interventions to restore human energy. These results are in line with previous research showing the energizing impact of contact with nature (Hartig et al., 2014; Pilotti et al., 2015) and relaxation strategies (Krajewski et al., 2010). However, moving beyond these previous studies, the present study transformed these respite activities into brief interventions, which could be completed at the workplace, and demonstrated how they may serve as a type of micro-break (Trougakos & Hideg, 2009). As in previous field studies testing workplace recovery interventions (e.g., Bono et al., 2013), the reported effects are rather small which could be expected due to the multitude of potential stressors and resources in participants' work and private lives. Actually, it has been argued that small effect sizes can tell a big story especially when a phenomenon can be detected even in inauspicious circumstances (Cortina & Landis, 2009). Overall, we conclude that engaging in these respite interventions helped the employees in our study to restore and maintain their energy levels on a daily basis.

Theoretical implications

These results provide several implications for organizational theory and research. Our findings help to determine that the effects of daily micro respite interventions have cumulative effects over time. These results are in line with the sustainable model of human energy in organizations (Quinn et al., 2012) with regard to the view that energy is dynamic and sustainable over time. These results are also consistent with Conversation of Resources theory (Halbesleben et al., 2014; Hobfoll, 2002), which proposes that resource trajectories are an important consideration in understanding the fluctuating of resources over time. However, to date, few studies have examined specifically how energetic resources at work can be aided by interventions, and fewer studies have examined whether such effects are cumulative, with notable exceptions (e.g. Pogrebtsova et al., in press). Our results suggest that these respite interventions can be used to facilitate the accumulation of resources and promote a positive trajectory of resources, in line with past research highlighting the role of respites in replenishing resources (see Halbesleben et al., 2014, p. 1350 for a review). Thus, the study illuminates the energy flow triggered by a daily respite exercise rather than focusing on an optimal design of a respite exercise and the associated recovery experiences.

Limitations

The study has several limitations. First, our sample consisted only of German office workers. Hence, the present results cannot be generalized to employees in other professions (e.g., assembly-line workers), other employment forms (e.g., self-employed), or individuals from different cultural backgrounds. However, since employees from different sectors and with different levels of education participated, the cautious conclusion may be drawn that respite interventions may posit an energizing effect independent of industry sector and an employee’s educational level.

Second, it can be assumed that mainly employees participated who felt strained or cared for their health, wanted to change their work respites, and believed in the positive effects of the intervention (self-selection). However, due to the experimental design with the successful randomization between the intervention groups and control group, the reported effects cannot be attributed to mere self-fulfilling prophecies.

Third, emphasizing this point, control participants were not merely waiting for weeks before starting the intervention period, but instead were actively reporting on their daily energy levels and affect. Such self-observation forms part of effective self-regulation (Carver & Scheier, 1981) and stress-management programs (e.g. Meichenbaum, 1985), which may lead to positive effects on the management of energy resources. Hence, the present control group could be viewed as a self-monitoring intervention (see Sitzmann & Wang, 2015).

Despite the strengths of using a randomized controlled trial, our design cannot rule out all alternative explanations. As in many other studies, we were not able to introduce placebo groups in a field experiment conducted in the work context and with the support of employers. This is a common practical issue when conducting interventions in organizational settings (O'Shea et al., 2016). Nevertheless, future research should also test the short respite interventions completed during work breaks against placebo control groups in field settings. Finally, due the rather low sample size and small effects, the study particularly calls for replication and extension by future research, which will be outlined below.

Future research

Although we did not focus on it in this paper, past research examining other types of daily interventions has shown moderating effects of individual or environmental variables (e.g. Clauss et al., 2016). However, we did control for baseline levels of vigor and exhaustion, as the baseline well-being of participants may affect the extent to which participants have the capacity to benefit from an intervention (Briner & Walshe, 2015). Like high work demands (Sonnentag & Kruel, 2006), low resources may reduce the degree of recovery experienced as a result of micro-break interventions. Hence, for employees low in resources, an extended break (e.g., vacation) or reducing job demands may be needed to refill the energy reservoir. Alternatively, skill training may be helpful to support the successful participation in intervention programs. Additionally, if respite interventions are undertaken during times of changes in job tasks or conditions, they may show differential effectiveness as change can be perceived as a threat or resource loss (Niessen & Jimmieson, 2016).

In the context of these considerations, it is also interesting to speculate about similarities and differences of the tested respite interventions with other established daily interventions applicable during work breaks. In contrast to other positive psychology interventions (PPIs), which specifically aim at eliciting positive emotions (e.g., three positive things intervention; Bono et al., 2013; Clauss et al., 2016) or dissolving negative emotions (e.g., reappraisal strategies; Hülsheger, 2015), the present respite interventions did not specifically focus on emotion regulation. Instead, somewhat like mindfulness exercises (e.g., Hülsheger, Alberts, Feinholdt, & Lang, 2013), it aimed on distancing oneself from the work context and its hassles by focusing on actual bodily states (PMRI) or on a mental image

(SNI). Thus, the energizing effects of the tested interventions were driven by energy restoration, and are in line with recovery processes (Sonnentag & Fritz, 2007). Although these recovery processes have mainly been used to explain leisure time recovery, their explanatory power should be further explored in the context of intervention research. Overall, gaining more insight into the underlying recovery experiences would allow classification of different break interventions and facilitate customized recommendations.

Practical implications

The present research has practical implications for the introduction of respite interventions to combat the energy drain among knowledge and office workers. First, respite interventions promote energy resources among employees by accumulating energy and fighting exhaustion on a daily basis through repeated practice. Hence, HR officers should facilitate and monitor regular execution of respite interventions and offer this information to strained employees. Second, it is also important to note that the versions of SNI and PMRI used in this study present rather "light" (less intensive) and office-compatible forms of nature contact and relaxation. Stronger effects could be expected through direct exposure to real nature (e.g., Kjellgren & Buhrkall, 2010) or sessions conducted by a relaxation trainer.

Conclusion

Building on the knowledge of organizational, social, and environmental psychology about energy resources and their management, we created two short respite interventions which can easily be integrated into work days. We showed their effectiveness for energy recovery during short breaks at the work place. The presented growth analyses and mediation analyses enhance our understanding of the processes contributing to energy gain and provide implications for future research. In sum, the presented respite interventions provide promising means to accumulate energy resources in the workplace.

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Table 1.
Means, standard deviations, reliabilities and correlations.

		Intervention group ($N = 52$) *M (SD)*	Control group ($N = 30$) *M (SD)*	Correlations 1	2	3	4	5	6	7	8
1	Pre-int. vigor	4.40 (1.12)	4.09 (1.20)	(.82)	. 80*	-.43*	-.46*	.61*	.28*	-.29*	-.22
2	Post-int. vigor	4.24 (1.23)	3.76 (1.00)		(.86)	-.41*	-.53*	.77*	.46*	-.38*	-.29*
3	Pre-int. exhaustion	2.92 (1.21)	3.08 (1.03)			(.91)	.88*	-.41*	-.18	.51*	.12
4	Post-int. exhaustion	2.90 (1.11)	3.19 (0.96)				(.91)	-.50*	-.22*	.60*	.20
5	Intercept afternoon vigor[a]	3.17 (0.41)	2.95 (0.45)					(.77)	.36*	-.36*	-.29*
6	Slope afternoon vigor[a]	0.04 (0.04)	0.02 (0.05)						(.77)	-.23*	49*
7	Intercept evening fatigue[a]	2.95 (0.44)	3.20 (0.54)							-	.19
8	Slope evening fatigue[a]	-0.02 (0.04)	0.00 (0.02)								-
9	Age	37.77 (10.00)	35.50 (13.54)	.07	.15	-.17	-.16	.19	.13	-.11	.03
10	Sex (1 = man, 0 = woman)	28 men	18 men	-.23*	-.19	-.01	.04	-.16	-.16	.01	.18
11	Working hours[b]	41.54 (9.08)	40.03 (5.77)	.04	-.01	.05	.02	-.01	-.13	.11	-.11

Notes. Participants $N = 82$, Internal consistency reliabilities appear in parentheses along the diagonal. No reliability could be calculated for the one-item measure fatigue. [a] Intercept and slope coefficients stem from the growth modeling analyses. [b] N = 81. $p <. 05$.

Table 2.

Growth modeling results predicting afternoon vigor.

	Model 1		Model 2		Model 3	
	P.E (SE)	*t*	P.E (SE)	*T*	P.E (SE)	*t*
(Intercept)	3.10(0.07)	45.83*	2.92(0.11)	27.70*	2.95(0.11)	26.67*
Time	0.03(0.01)	2.95*	0.03(0.01)	2.98*	0.02(0.02)	0.90
Condition			0.29(0.13)	2.26*	0.21(0.14)	1.54
TIME X Condition					0.03(0.02)	1.38
Variance Components						
(Intercept)	0.205		0.199		0.243	
TIME	0.002		0.002		0.004	
Residual	0.345		0.346		0.317	
Fit index: AIC	1494.66		1494.09		1509.89	

Note. P.E.= Paramater Estimate. SE= Standard Error. Degrees of freedom: Condition *df* =80. Time and Time X Condition *df*=658. For Condition the reference group is control condition (value 0). $^{+}$ p <. .10, * p <. 05.

Table 3.
Growth modeling results predicting evening fatigue.

	Model 1		Model 2		Model 3	
	P.E (SE)	*t*	P.E (SE)	*t*	P.E (SE)	*t*
(Intercept)	3.04(0.08)	36.34*	3.28(0.12)	26.62*	3.17(0.14)	22.93*
Time	-0.01(0.01)	-1.15	-0.01(0.01)	-1.18	0.01(0.02)	0.65
Condition			-0.37(0.14)	-2.64*	-0.20(0.17)	-1.15
TIME X Condition					-0.04(0.03)	-1.76^{+}
Variance Components						
(Intercept)	0.337		0.340		0.336	
TIME	0.003		0.004		0.003	
Residual	0.605		0.605		0.605	
Fit index: AIC	1915.978		1913.52		1918.026	

Note. P.E.= Parameter Estimate. SE= Standard Error. Degrees of freedom: Condition *df* =80. Time and Time X Condition *df*=654. For Condition the reference group is control condition (value 0). $^{+}$ p <. .10, * p <. 05.

Table 4.
Mediation model 3: Intercept and slope afternoon vigor as mediators of the effect of respite intervention on post-intervention vigor.

	Intercept afternoon vigor		Slope afternoon vigor		Post-int. vigor	
Variable	Effect (SE)	*t*	Effect (SE)	*t*	Effect (SE)	*t*
Constant	2.05 (0.17)	12.28*	-0.02 (0.02)	-1.05	-1.61 (0.56)	-2.85*
Pre-int. vigor	0.22 (0.03)	6.55*	0.01 (0.00)	2.27*	0.50 (0.08)	6.55*
Condition	0.15 (0.09)	1.93^{+}	0.02 (0.01)	1.64	0.00 (0.14)	0.02
Intercept afternoon vigor					1.09 (0.20)	5.50*
Slope afternoon vigor					4.58 (1.73)	2.64*
R^2	.40		.12		.79	
F	23.24*		5.12*		68.66*	

Notes. $N = 82$. Values are unstandardized regression coefficients; standard error estimates are in parentheses. $^{+}p < .10$, $*p < .05$.

Table 5.
Mediation model 4: Intercept and slope evening fatigue as mediators of the effect of respite intervention on post-intervention exhaustion.

	Intercept evening fatigue		Slope evening fatigue		Post-int. exhaustion	
Variable	Effect (SE)	*t*	Effect (SE)	*t*	Effect (SE)	*t*
Constant	2.55 (0.17)	14.95*	-0.01 (0.01)	-1.16	-0.27 (0.40)	-0.71
Pre-int. exhaustion	0.21 (0.04)	5.72*	0.00 (0.00)	0.94	0.72 (0.05)	13.36*
Condition	-0.22 (0.11)	-2.05*	-0.02 (0.01)	-2.64*	-0.04 (0.12)	-0.30
Intercept evening fatigue					0.39 (0.16)	2.53*
Slope evening fatigue					2.21 (1.76)	1.25
R^2	.31		.08		.81	
F	27.04*		4.33*		68.66*	

Notes. $N = 82$. Values are unstandardized regression coefficients; standard error estimates are in parentheses. $^{+}p < .10$, $*p < .05$.

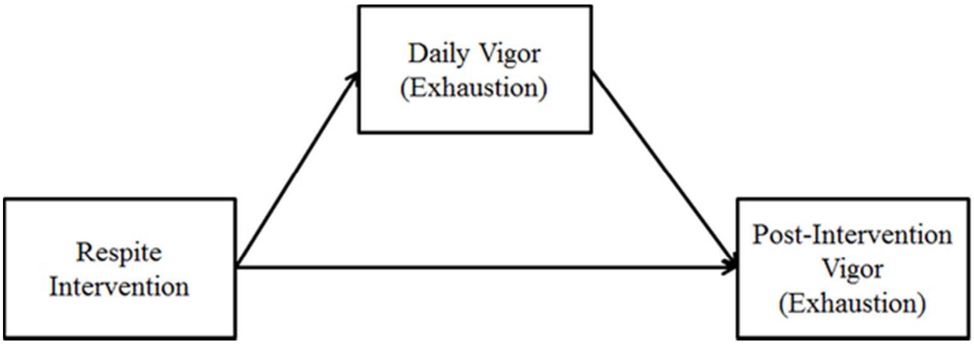

Figure 1. Conceptual model of the main hypothesis.

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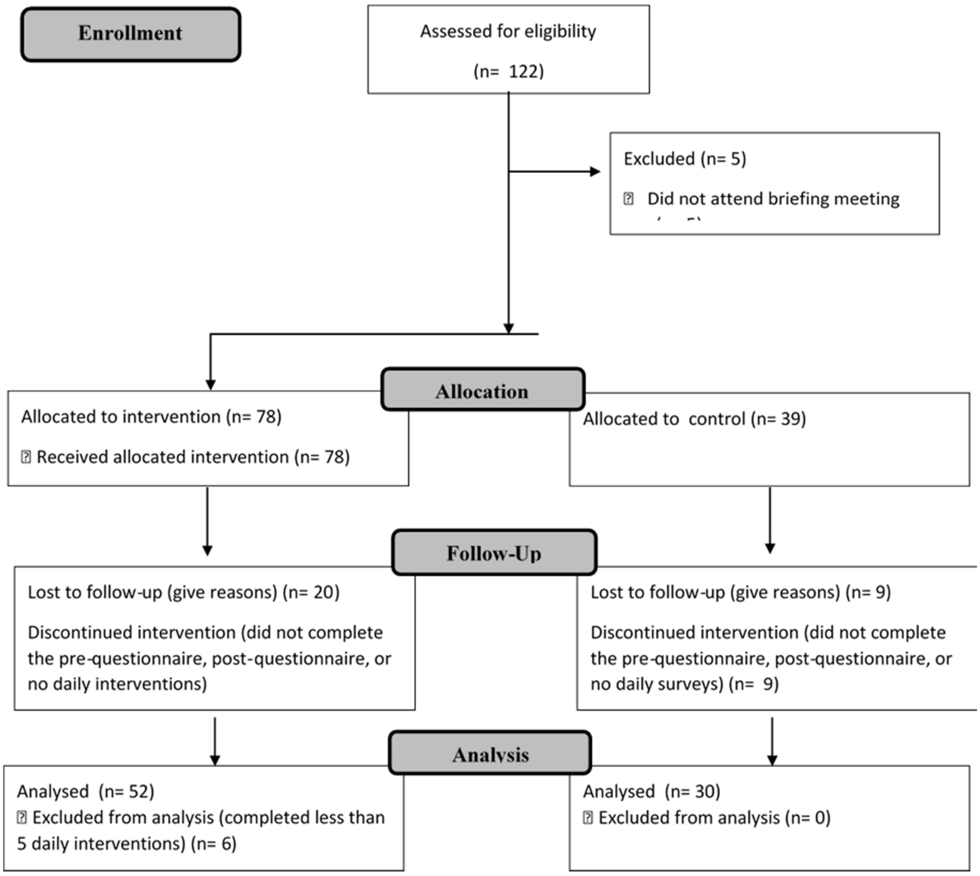

Figure 2. Consort flow diagram

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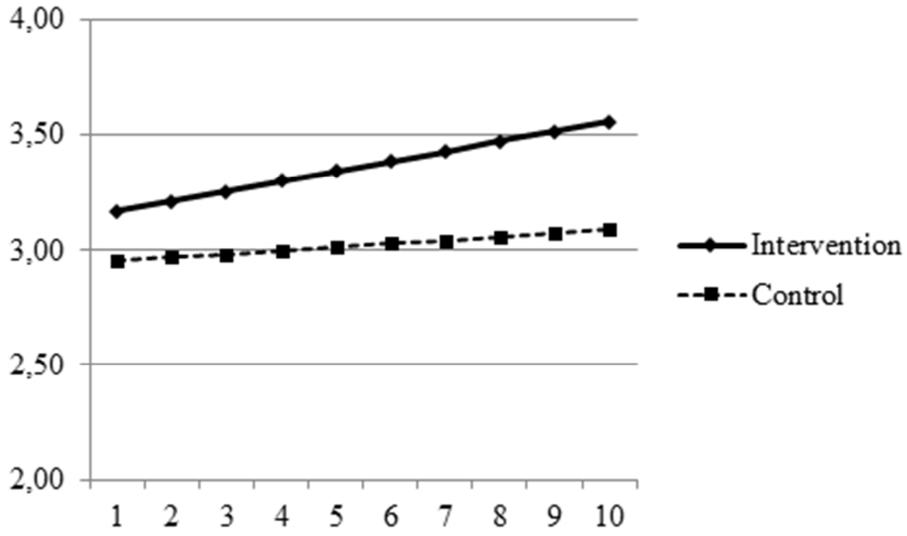

Figure 3. Predicted values of afternoon vigor based on the estimation of the growth model presented in table 2. This figure shows the positive growth trend of the time-afternoon vigor slope over the ten intervention days for the participants in the intervention conditions as compared to the control condition.

102x60mm (120 x 120 DPI)

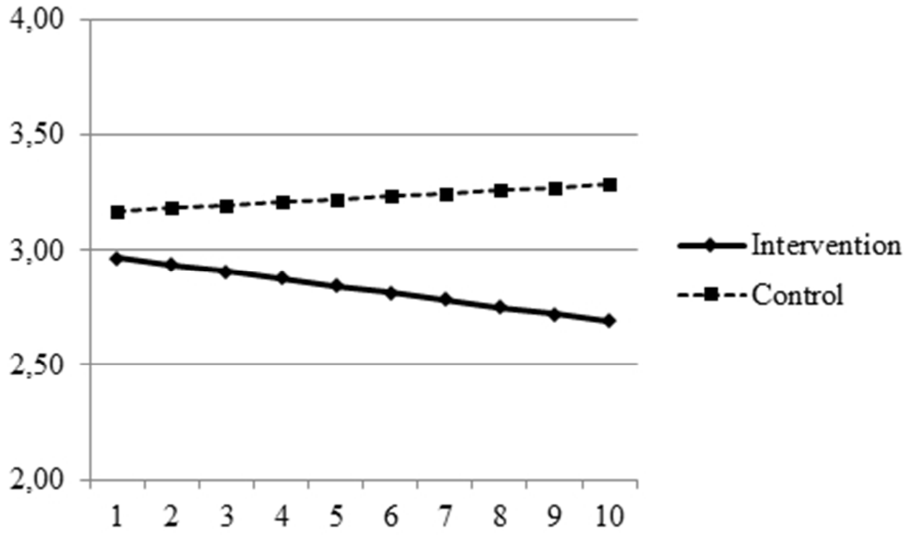

Figure 4. Predicted values of evening fatigue based on the estimation of the growth model presented in table 3. This figure shows the negative growth trend of the time-evening fatigue slope over the ten intervention days for the participants in the intervention conditions as compared to the control condition.

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